College, in presenting Prof. Kowalevsky, of St. Petersburg, for the honorary degree of Doctor in Science:—

Russorum ab imperio maximo legatus ad nos subito advectus est vir illustris, qui investigandi rationes novas inter primos secutus, animantium formas quasdam inferiores ex alia in aliam paullatim mutatas identidem indagavit; qui in confinio inter genera vertebris instructa et vertebris carentia iampridem moratus, Amphioxi speciem ambiguam primus explicavit; qui larvae denique Ascidianae cum vertebrato animalium genere affinitatem imprimis indicavit. Atqui, ne talium quidem virorum praeceptis attonitus, larvae illius degeneris propinquitatem reformidabit homo non terrestris tantum sed etiam caelestis originis conscius, qui angelis paullo minor, gloria et honore est coronatus, super oves et boves, super feras omnes, super volucres et pisces, super omnia quae maris per vias pererrant, a Deo constitutus.

Duco ad vos Zoologiae Professorem Petropolitanum, ALEXANDRUM KOWALEVSKY.

The General Board have issued a report recommending that the stipends of the Reader in Botany (Mr. F. Darwin), the Lecturer in Organic Chemistry (Mr. Ruhemann), the Lecturer in Experimental Psychology (Dr. Rivers), and the Curator in Zoology (Mr. D. Sharp), should be increased; and that new Lectureships in Palæozoology and in Physical Anthropology should be established.

A University Lectureship in Applied Mathematics will be vacant at Michaelmas by the resignation of Mr. Love, now Sedleian Professor at Oxford. Candidates are to send their names to the Vice-Chancellor by May 30. The stipend is 50*l.* a year.

The new Professorship of Agriculture, with a stipend of 800*l.* a year contributed by the Drapers' Company, was established by grace of the Senate on May 11.

THE Board of Education Bill was read for a third time, and passed, in the House of Lords on Monday.

THE foundation-stone of a new school and technical institute, connected with the Sir John Cass Foundation, in Jewry Street, Aldgate, was laid on Thursday last by the Bishop of London. The plans of Mr. A. W. Cooksey have been accepted for the new buildings, which will be in English Renaissance style, and will cost 45,000*l.*

MR. ANDREW CARNEGIE has written to the Right Hon. Joseph Chamberlain with reference to the proposed establishment of a University at Birmingham, and the correspondence is published in the *Birmingham Daily Post*. Mr. Carnegie refers in the correspondence to the great advantage which the iron and steel industries of the United States have derived from the Cornell University, and goes on to remark that "if Birmingham were to take that University as its model, where the scientific has won first place in the number of students, and give degrees in science as in classics, I should be delighted to contribute the last 50,000*l.* of the sum you have set out to raise to establish the scientific department." In addition to this Mr. Chamberlain, writing to the Lord Mayor of Birmingham, announces that an anonymous friend who had previously promised 25,000*l.* has agreed to increase his offer to 37,500*l.* on condition that the full amount of 250,000*l.* required for the *minimum* endowment is obtained. There still remains 12,000*l.* to be raised before the quarter of a million required is reached.

AT the annual celebration of Presentation Day of London University, held on May 10, the Earl of Kimberley presided for the first time as Chancellor. Referring to the Act passed last year, the Chancellor remarked that under the provisions of that Act and under the statutes made, the examination part of the University, by which the University had hitherto been known and in which it had done most excellent work, would be duly preserved. What was to be added was very important indeed, and it would become, he hoped, a great teaching University. They were at last beginning to appreciate the great changes which had taken place in the world, and in the advancement of science especially. Those changes had required others in the framing of the highest education. Not that they should for one moment abandon the old system of laying a good broad foundation of education, but that they should add to it the greater cultivation of the sciences, of economic science, and of all those arts which had grown to be of such great importance to this country. What they wanted was to bring together, as far as possible, all those various agencies provided for higher education in the metropolis.

INQUIRIES as to the schools in which leading men in various professions were educated have been made by *The School World*, and the results for men of science are published in the current number. Of 250 representative men of science—mostly Fellows of the Royal Society—chosen for the present inquiry, one-fifth received their early education either in private schools or at home under tutors. The schools which claim the greatest number of old pupils in the selected list are Edinburgh High School, Edinburgh Academy, and Aberdeen Grammar School. The Scotch schools are followed, as regards the number of old pupils of distinguished eminence in science, by the City of London School and King's College School. Eton, Harrow, and Rugby succeed these, and are in turn followed by Liverpool College, Royal Institution School (Liverpool), and St. Paul's. The remarkable point brought out by this comparison is the small part the great public schools have taken in training the leaders in science of the present day. When the men who are now in the foremost rank among philosophers were receiving their early education science was almost, if not quite, omitted from the public school curriculum, with the result that comparatively few boys from such schools have become eminent in the scientific world. The neglect of science in comparison with other subjects is shown by the fact that Eton, Harrow, Rugby, Winchester, Westminster, and one or two other public schools, though comparatively poor in their scientific record, are shown by *The School World* to have furnished the greatest number of leading men in Parliament, the Church, and the Law, Eton leading the way as regards numbers in each of these classes.

THE proposal to utilise the buildings of the Imperial Institute for the purposes of the new London University was referred to in the report read at the annual meeting of the Fellows of the Institute on Monday. Lord James of Hereford, who has succeeded the late Lord Herschell as chairman of the governing body, in moving the adoption of the report remarked that a new lease of life had been brought within the purview of the Institute. Those responsible for its management had been approached by the Government, who had to find accommodation for the London University. In the Institute they possessed a very great area of accommodation not needed by them, which could be devoted with very little adaptation for the purposes of the University. In the first place, to bring a great seat of learning under the roof of the Institute seemed to the governing body to be in accordance with the objects for which the Institute came into existence. But it was only right that he should tell them that in affording this accommodation to the London University they were receiving from the Government a very substantial return. He was not in the position to enter into any details, because all the arrangements had not yet been completed, but he might say that the negotiations were proceeding, and that by the financial return for the provision of the necessary accommodation for the University the governors of the Institute would be relieved of many burdens. The real result would be that they would have all anxiety removed with regard to the future conduct of the Institute.

SCIENTIFIC SERIALS.

Meteorologische Zeitschrift, February.—Results of the international balloon ascent, by Dr. H. Hergesell. This is the first of a proposed series of papers; the present one deals principally with the range of temperature, as shown by observations made in a captive balloon at Strassburg on June 7 and 8, 1898. The results prove that in strata of free air, whose height exceeds a few hundred metres, the temperature possesses an extremely small diurnal range. During the night it scarcely amounts to a few tenths of a degree; while in the daytime a variation of some three or four degrees Centigrade may occur, even at a height of 800 metres, when vertical air currents exist. In the absence of these, the range would, in all probability, sink to a very low value.—On the characteristics of mild winters, by Dr. G. Hellmann. The last two mild winters have induced the author to revise his previous researches upon this subject, and he gives particulars of the 51 mild winters experienced in Berlin during the last 180 years. The principal results arrived at are: that mild winters scarcely ever occur singly, but in groups of two or three; that they are usually of long duration, from November to February or March; severe and long, late winters (February and March) seldom occur after mild mid-

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winters; in mild mid-winters the greatest variations of temperature usually occur in January. After a very mild winter, a warm summer is more probable than after a winter which is only moderately mild. Dr. Hellmann pleads for synoptic charts for the whole globe—at least for short intervals, if longer periods cannot be undertaken.

IN the *Journal of Botany* for April and May, Mr. A. Lister describes and figures some new or interesting species of Mycetozoa; Mr. E. A. N. Arber discusses the relationship to one another of the various forms of indefinite inflorescence; Mr. A. Gepp records the detection in Britain of a genus of Saprolegneous fungi, *Apodachlya;* Mr. G. S. West continues his account of the alga-flora of Cambridgeshire; Mr. F. S. Williams, his critical notes on species of *Cerastium;* and Mr. H. C. Hart, his account of a botanical excursion in Donegal.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 16.—"Experiments in Micro-metallurgy:—Effects of Strain. Preliminary Notice." By Prof. Ewing, F.R.S., and Walter Rosenhain, 1851 Exhibition Research Scholar, Melbourne University.

Much information has been obtained regarding the structure of metals by the methods of microscopic examination initiated by Sorby and successfully pursued by Andrews, Arnold, Charpy, Martens, Osmond, Roberts-Austen, Stead, and others. When a highly polished surface of metal is lightly etched and examined under the microscope, it reveals a structure which shows that the metal is made up in general of irregularly shaped grains with well-defined bounding surfaces. The exposed face of each grain has been found to consist of a multitude of crystal facets with a definite orientation. Seen under oblique illumination, these facets exhibit themselves by reflecting the light in a uniform manner over each single grain, but in very various manners over different grains, and, by changing the angle of incidence of the light, one or another grain is made to flash out comparatively brightly over its whole exposed surface, while others become dark.

The grains appear to be produced by crystallisation proceeding, more or less simultaneously, from as many centres or nuclei as there are grains, and the irregular more or less polygonal boundaries which are seen on a polished and etched surface result from the meeting of these crystal growths. The grains are, in fact, crystals, except that each of their bounding surfaces is casually determined by the meeting of one growth with another.

The experiments, of which this is a preliminary account, have been directed to examine the behaviour of the crystalline grains when the metal is subjected to strain.

For this purpose we have watched a polished surface under the microscope while the metal was gradually extended until it broke. By arranging a small straining machine on the stage of the microscope, we have been able to keep under continuous observation a particular group of crystalline grains while the piece was being stretched, and have obtained series of photographs showing the same group at various stages in the process. Strips of annealed sheet iron, sheet copper, and other metals have been examined in this way. We have also observed the effects of strain on the polished surfaces of bars in a 50-ton testing machine by means of a microscope hung from the bar itself, and have further observed the effects of compression and of torsion.

When a piece of iron or other metal exhibiting the usual granular structure is stretched beyond its elastic limit, a remarkable change occurs in the appearance of the polished and etched surface, as seen by the usual method of "vertical" illumination. A number of sharp black lines appear on the faces of the crystalline grains: at first they appear on a few grains only, and as the straining is continued they appear on more and more grains. On each grain they are more or less straight and parallel, but their directions are different on different grains. At first, just as the yield-point of the material is passed, the few lines which can be seen are for the most part transverse to the direction of the pull. As the stretch becomes greater oblique systems of lines on other grains come into view.

The photograph, Fig. 1, taken from a strip of transformer plate (rolled from Swedish iron and annealed after rolling), gives a characteristic view of these lines as they appear after a moderate amount of permanent stretching, but long before the iron has reached its breaking limit.

The appearance of each grain is so like that of a crevassed glacier, that these dark lines might readily be taken for cracks.

The real character of the lines is apparent when the crystalline constitution of each grain is considered. They are not cracks, but *slips* along planes of cleavage or gliding planes.

Fig. 2 is intended to represent a section through the upper part of two contiguous surface grains, having cleavage or gliding planes as indicated by the cross-hatching, AB being a portion of the polished surface. When the metal is pulled beyond its elastic limit, in the direction of the line A B, yielding takes place

FIG. 1.—Soft sheet iron strained by tension. 400 diameters.

by finite amounts of slips occurring at a limited number of places in the manner shown at *a*, *b*, *c*, *d*, *e* (Fig. 3). This slip exposes short portions of inclined surfaces, and when viewed under normally incident light, these surfaces appear black because they return no light to the microscope. They are consequently seen as dark lines or narrow bands, extending over the polished surface in directions which depend on the intersection of the polished surface with the surfaces of slip.

We have proved the correctness of this view by examining these bands under oblique light. When the light is incident at

Fig. 2. Before straining.

only a small angle to the polished surface, the surface appears for the most part dark; but here and there a system of the parallel bands shines out brilliantly in consequence of the short cleavage or gliding surfaces which constitute the bands having the proper inclination for reflecting the light into the microscope. Rotation of the stage to which the strained specimen is fixed makes the bands on one or another of the grains flash out successively, with kaleidoscopic effect. In what follows we shall speak of these lines as slip-bands. Fig. 1, through a mixed illumination, shows some of the slip-bands bright and some dark.

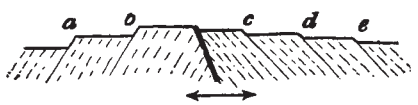

Fig. 3. After straining.

When the metal is much strained a second system of bands appears on some of the grains, crossing the first system at an angle, and in some cases showing little steps where the lines cross. These bands are clearly due to slips occurring in a second set of cleavage or gliding surfaces. Occasionally a third system of bands may be seen.

When the experiment is made with a polished but unetched specimen the slip-bands appear equally well. The boundaries of the grains are invisible before straining; but they can be distinguished as the strain proceeds, for the slip-bands form a cross-hatching which serves to mark out the surface of each grain.

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